

WE are informed that the lists of papers, &c., appended to Mr. C. R. Markham's "Fifty Years' Work of the Geographical Society," referred to in our leading article of last week, were not compiled by Mr. Rye.

THE additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus* ♀), from India, presented by Mr. G. R. J. Glennie; a Rhesus Monkey (*Macacus erythraeus* ♀) from India, presented by Miss Richardson; a Malbrouck Monkey (*Cercopithecus cynosurus* ♂) from West Africa, presented by Mr. J. Pope; a Black-faced Kangaroo (*Macropus melanops* ♂) from Australia, presented by Miss Drax; a Black-headed Gull (*Larus ridibundus*), European, presented by Master Rew Lloyd; two Common Kestrels (*Tinnunculus alaudarius*), British, presented by Masters John and Charles Godfrey; a Snow Bunting (*Plectrophanes nivalis*), North European, presented by Mr. H. A. Macpherson; a ——— Monkey (*Macacus*, sp. inc. ♂) from Hainan Island, China, deposited; a Sooty Mangabey (*Cercopithecus fuliginosus* ♂) from West Africa, an Ariel Toucan (*Ramphastos ariel*) from Brazil, a Naked-footed Owllet (*Athene noctua*), European, an Ornamental Hawk Eagle (*Spizaetus ornatus*), a Black Tortoise (*Testudo carbonaria*), an Argentine Tortoise (*Testudo argentina*) from South America, two Radiated Tortoises (*Testudo radiata*) from Madagascar, purchased; a Gaimard's Rat Kangaroo (*Hypsiprymnus gaimardi*), born in the Gardens.

#### OUR ASTRONOMICAL COLUMN

COMET 1881 *f* (DENNING).—From the elements of the orbit of this comet it is evident that it was a much more conspicuous object about the time of perihelion passage in the middle of September, than when it was detected by Mr. Denning on the morning of October 4, and its not having been sooner discovered can only be attributed to the general prevalence of clouded skies in September. Mr. Denning writes us that from September 2 to 29 he could not make a single observation before sunrise, owing to cloudy weather, but that on the mornings of September 29 and October 1 he missed the comet "in some unaccountable manner." The comet having escaped in September, the systematic examination of the sky, which is now pursued by him, is thus explained.

It ought now to be possible to decide by calculation from accurate positions, whether the comet be one of short period or not. The resemblance of the orbit to that of the fourth comet of 1819 has been pointed out. That comet was undoubtedly moving in an elliptical orbit of very limited dimensions: a computation founded upon a new reduction of the observations made at the Observatory of Paris, which alone are precise enough for the purpose, has led Mr. Hind to a period of revolution of 5'155 years, which is somewhat longer than that deduced by Encke in 1820 from the same observations as they were published at the time by Bouvard. At the previous aphelion passage in 1817 the comet would pass in close proximity to the planet Jupiter, and considerable perturbations may have then occurred. In the interval between the perihelion passage of the comet of 1819 and that of Mr. Denning's comet there are twelve periods of 5'151 years, and the comet would again be greatly disturbed by Jupiter near aphelion in 1853, so that it is possible to explain to a great extent the differences between the orbits of 1819 and 1881, but that the period of revolution should not have undergone material alteration at the same time, may perhaps be considered as an argument against the identity of the comets. However, as we have intimated, the question should soon be decided by direct calculation. Less than a fortnight's observations have been shown in more cases than one to be sufficient to give pretty close approximations to the periods of comets moving in small ellipses, as in the case of De Vico's comet of 1844, for which from only eight days' observations M. Faye inferred a revolution of 5'15 years, the correct one being 5'46 years, or that of Brorsen's comet at its first appearance in 1846, when from ten days' observations Mr. Hind assigned a revolution of 5'519 years, the true one being 5'569 years.

The following positions of Mr. Denning's comet are from an ephemeris calculated by Dr. Oppenheim for Berlin midnight:—

|          |    |     | R.A. |    |    | Decl.        | Log. distance from |        |        |
|----------|----|-----|------|----|----|--------------|--------------------|--------|--------|
|          |    |     | h.   | m. | s. |              | Sun.               | Earth. |        |
| October  | 28 | ... | 10   | 10 | 0  | + 14° 51' 6" |                    |        |        |
|          | 30 | ... | 10   | 13 | 1  | 14 52' 2"    | 0'0685             | ...    | 0'0411 |
| November | 1  | ... | 10   | 15 | 52 | 14 53' 1"    |                    |        |        |
|          | 3  | ... | 10   | 18 | 35 | 14 54' 5"    | 0'0888             | ...    | 0'0503 |
|          | 5  | ... | 10   | 21 | 7  | 14 56' 4"    |                    |        |        |
|          | 7  | ... | 10   | 23 | 30 | 14 58' 7"    | 0'1084             | ...    | 0'0582 |
|          | 9  | ... | 10   | 25 | 44 | 15 1' 4"     |                    |        |        |
|          |    |     |      |    |    |              |                    |        |        |

The intensity of light on November 9 is less than half that on the day of discovery.

HERSCHEL'S "GARNET SIDUS."—This variable star, the  $\mu$  Cephei of our Catalogues, appears to require more regular observation than, to judge from published statements, it has of late received, and is an object well deserving the attention of some one of our many amateurs. No doubt satisfactory observations are attended with some difficulty from the high colour of the star, but on that account the results of a single observer may perhaps be deemed more reliable. Mr. Webb, in the new edition of his "Celestial Objects for Common Telescopes," assigns it a period of five or six years, which is assuredly a mistake. It has been included amongst the irregular variables, and its period may be usually about 430 days, instead of several years. Argelander, as an approximation to the period, gives 431'8 days, from observations between 1848 and 1863, but there are very material perturbations. He considered that the period of increase of brightness is greater than that of decrease in the proportion of 4 to 3. The position of  $\mu$  Cephei for 1882 is in R.A. 21h. 39m. 53'7s., Decl. + 58° 14' 21".

This star, which was not observed by Flamsteed, is the first of Ptolemy's ἀμρφαροι, under the constellation Cepheus, which he places in 13° 40' of Pisces with 64° north latitude. If we carry back the position of the variable star from the second Radcliffe catalogue to the reputed epoch of Ptolemy's catalogue—the first year of Antoninus, or A.D. 138—we find its longitude to be in 14° 16' of Pisces, with north latitude 64° 7', so that, as was first shown by Argelander (*Astron. Nach. Ergänzungsheft*), the identity is beyond doubt.

#### GEOGRAPHICAL NOTES

THE St. Petersburg Correspondent of the *Times* writes as follows:—The question of the existence of volcanoes in Central Asia, especially on the Kuldja frontier, has always been a matter of doubt and discussion among geologists and Russian explorers. The Governor of Semiretchinsk, Gen. Kolpakofsky, had already fitted out expeditions to settle the question—once in 1878, and again in 1879; but owing to the difficulties of reaching the mountains, which the Chinese consider impassable, and also to the disorders which were then taking place in Kashgar, both expeditions were unsuccessful. This year General Kolpakofsky again set himself to the task, and now reports that he has at last discovered the perpetual fires in the Thian Shan range of mountains. He telegraphs that the mountain Bai Shan has been found twelve miles north-east of the City of Kuldja, in a basin surrounded by the massive Ailak Mountains, and that the fires which have been burning there from time immemorial are not volcanic, but proceed from burning coal. On the sides of the mountain there are caves emitting smoke and sulphurous gas. The *Official Messenger*, referring to this interesting telegram, observes that the question as to the existence of volcanic formations in Central Asia, which has so long agitated the learned world, is now irrevocably decided in the negative, and bears the testimony of many Russian explorers. Mr. Schuyler also, in his "Turkistan," mentions that these perpetual fires in the mountains referred to by Chinese historians were considered by Severtzoff, who explored the region, as being caused by the ignition of the seams of coal or the carburetted hydrogen gas in the seams. The same author further mentions that Capt. Tosnoffsky, another Russian explorer, was told of a place in the neighbourhood from which steam constantly rose, and that near this crevice there had existed from ancient times three pits, where persons afflicted with rheumatism or skin diseases were in the habit of bathing.

MR. DORWARD, of the China Inland Mission, has lately made a lengthened journey in the Chinese province of Hunan, of which he has sent home somewhat full particulars. He was absent from Wuchang, opposite Hankow, on the Yang-tsze-kiang, for five and a half months, and visited almost every part of this

province, so notorious for its turbulent braves, whose hostility to foreigners is proverbial. Mr. Dorward has however established the fact that a European, with two native assistants, can now traverse the province in safety. Near the city of Shênchi, some 450 miles from Wuchang, he had an opportunity of observing the processes used for extracting gold-dust from the sand, which consist in roughly sifting and afterwards using quicksilver.

THE Argentine Government has just despatched two officials to survey five thousand square leagues of country in the neighbourhood of the Neuquem, one of the chief tributaries of the Rio Negro. This extensive tract of country is close to the Andes, and is said to be extremely fertile. When the survey is completed the Government will dispose of the land with a view to its early colonisation.

THE Commercial Geographical Society of Bordeaux in its last *Bulletin* publishes a useful topographical note on the itinerary followed by the Upper Niger Surveying Expedition from Kita to Bamaku.

THE Department of the Interior in Canada has issued a new map of Manitoba and the North-West Territories, showing the country surveyed, &c., and in a later edition the line of the Canadian Pacific Railway will be shown.

WE hear that the Dépôt de la Guerre at Paris has just issued the first sheet of Col. Perrier's map of Tunis, drawn from his recent topographical survey of the country, which has been awaited with much impatience by French geographers.

PÈRE DUPARQUET, the well-known missionary traveller, who returned to South-West Africa early in October, has recently commenced the publication, in *Les Missions Catholiques*, of an account of a journey made by him through Ovampo Land as far as the River Cunene. He travelled in company with Mr. Erchison, one of the principal traders of Omaruru, who also had with him a son of the late Mr. C. J. Anderson. Père Duparquet's memoir is illustrated by a sketch-map of the region, on which is shown a singular connection between the River Cunene and Lake Etosha.

IN the new number (Heft 3, Band 4) of the *Deutsche geographische Blätter*, all the existing information on Wrangel Land and Herald Island has been collected, and will be of interest at present in connection with the missing *Jeannette*. Dr. Albrecht Penck of Munich contributes an interesting article on glaciation with special reference to Eschscholtz Bay in Kotzebue Sound on the north-west coast of America; and Herr G. Kreitner gives a detailed account of the Koko Nor and the surrounding region. There are besides a variety of notes on various points of geographical interest.

TO the Austrian *Monatsschrift für den Orient* for October, M. Z. Janiczek of Port Said contributes a letter containing a good deal of valuable information on the trade of the Red Sea. In a letter from Herr Hansel of Khartoum we find some interesting information from Dr. Emin Bey. Among other things he tells us that there are three lakes to the north of Victoria Nyanza; that Beatrice Gulf certainly does not belong to Albert Nyanza, but to a lake lying from the south; that steamers now go regularly from Dufilé to Mahagi, a station on the west coast of Lake Albert; and that the only radical cure for the Central African slave-trade is the importation of free Chinese colonists. Prof. Blumentritt contributes notes on some important vegetable products and branches of industry in the Philippine Islands.

HEFT I, for 1880-1, of the *Mittheilungen* of the Hamburg Geographical Society contains a paper of great interest on the distribution and relative value of cowrie shells by Herr John E. Hertz. These shells are used as money mainly in the region between the Niger and the coast of Africa, though they are also in use in other parts of the world. Herr Hertz gives the exchange value of these shells in the various regions where they are used, and traces their history as a trading medium. A kindred paper, of much practical value and considerable interest, is on the barter-trade of Africa, by A. Wörmann. A long paper, with chart, on the paths of barometric minima in Europe and on the North Atlantic, and their influence on wind and weather in North Germany, by Dr. W. Köppen, is of considerable scientific interest. There is also a lecture by Dr. J. Classen on a visit to Olympia.

ACCORDING to the latest census the population of Japan on January 1, 1880, was 35,925,313. Of these 18,210,500 were males, and 17,714,813 females. When the numerous and de-

structive civil wars of the last twenty years are remembered, this relative proportion of the sexes will appear striking. Writers of the last century held very exaggerated notions of the population of Japanese towns, but the present census shows that some of them may properly rank among the most populous cities in the world. Tokio and its environs has a population of 957,121; Kioto, the old capital, of 822,098; and Osaka, 582,668. The smallest population of any district is that of the Bonin Islands, recently annexed to Japan, which contain only 156 inhabitants, composed of officials and descendants of Kanakas and deserters from English and American whaling vessels.

CAPT. JOHN MACKAY, of the ss. *Southern Cross* (Auckland), sends us, along with a note, an account by himself in the *Queenslander* of his discovery and settlement of the district of Mackay in Queensland. To the now flourishing town of Mackay we referred some time ago in connection with a special number of the *Mackay Standard*. The town bids fair to become one of the most flourishing in Queensland, though its discoverer does not seem to have met with the recognition he deserves.

## SOLAR PHYSICS<sup>1</sup>

### II.

AT the conclusion of my last lecture I stated my belief that those changes which are continually going on at the surface of the sun had their origin in currents of convection, and I illustrated the processes which are there going on by what we know to be going on on the surface of our own earth. I referred, but only historically, to a theory which was thrown out many years ago as to the origin of solar heat by Sir William Thomson, according to which it depended on the impact of meteoric bodies. I did not suppose at the time that he still retained that theory, regarding it as the most probable; in fact he gave it up many years ago, and I was glad to find, from conversation with him after the lecture, he is quite of the same opinion as I am, that these disturbances—the enormous disturbances which take place at the surface of the sun, have their origin in currents of convection. I stated my belief that the spots were produced by the downward rush of, comparatively speaking, cool portions of gas which had been in the first instance ejected during these eruptions. In speaking to Mr. Lockyer afterwards I found that he had obtained independent evidence from his spectroscopic researches that these spots consisted of down-rushes of gas, and not, as some have supposed, of up-rushes. He may have mentioned it to me before; if so I must apologise for it having passed from my memory. I will not however say anything about the evidence on which he was led to that conclusion, because he is going to lecture himself, and of course he will be the proper person to explain his own discoveries.

Now with regard to these spots I have hitherto said nothing except as to their existence. The German astronomer Schwabe assiduously observed them in the beginning of 1826, and for about a quarter of a century he went on constantly observing them and making careful drawings of them. As the result of this long-continued and careful work, he was led to the conclusion that these spots as to their frequency and magnitude appear to be subject to a periodical inequality. The period appeared to be about ten years, during which, supposing you start with the maximum of spots, they dwindle away to the minimum, then after some years again rise afresh, and by the end of ten years or thereabouts you get to the maximum. M. Wolf of Berne has discussed the subject, and referred back to older observations, and was led to the conclusion that the period was longer than ten years. He makes it eleven years, or perhaps more exactly nine periods per century.

I will now come to some phenomena observed on the earth with which the solar spots would, at first sight, appear to have no possible connection. You are all, of course, familiar with the magnetism of the earth, by the aid of which our ships are navigated through the ocean. Now it has been long known that the magnetic needle is subject to disturbance; by the magnetic needle I mean the magnet suspended so as to turn freely round a vertical axis. For a long time after the discovery of magnetism that was the only kind of instrument used for the observation, and it had been observed that these disturbances were of two kinds. There was a regular diurnal movement of the needle to the west, and then to the east, of its mean position,

<sup>1</sup> Lecture by Prof. Stokes, Sec. R.S., in the South Kensington Museum Theatre, continued from p. 598.